

2013

Kennedy Space Center

Annual Sustainability Report

25,540 Tons
of C&D Waste
Diverted

38%
Reduction
in Energy
Intensity as
Compared to
FY 2003

\$1.9M of
Renewable
Electricity
Generated
Onsite

35% of
Fuel was
Alternative

245 Tons of
Copper
Recycled



Kennedy Space Center is
GO for GREEN!



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Executive Summary

To help transform Kennedy Space Center into America's premier 21st century sustainable spaceport, sustainability concepts and philosophy are inherent in our mission and goals, as outlined in the 2013 to 2015 Kennedy Space Center Sustainability Plan. Our objective is to "promote, maintain, and pioneer green practices in all aspects of our mission, striving to be an agency leader in everything we do." This 2013 Annual Report highlights many sustainability projects being pursued at Kennedy in support of our Sustainability Plan and mission.

Now more than ever, sustainable programs and initiatives propel NASA as the agency moves forward towards its objectives. As shown in this report, data clearly indicates the successes of our many programs. All around the center waste is being diverted, recycled or reused along with the introduction of new sustainability initiatives spanning energy and water conservation, acquisition, transportation, property disposal, logistics, information technology, waste management, green construction, ecology and more. Kennedy will continue to use proven, socially responsible methods to reduce our footprint on the planet. All of our combined efforts have the added benefit of advancing NASA's missions.











This 2013 Annual Report, which is divided into three sections, highlights many projects that support our Sustainability Plan and mission. The first section includes a scorecard for fiscal year (FY) 2013 that provides analysis of Kennedy's goals and performance. The second section is a series of highlights that include sustainable office moves; reduction in paper used for construction of facilities; replacing canned air; spent blast media reuse; mist reduction eliminator in chilling towers; recycling items such as refrigerants, carpet, diesel fuel and hard hats; and personal computer energy management. Finally, this report concludes with extended feature articles describing a trash to gas project, electric car charging stations, a bald eagle rescue and a sustainable fitness trail. More stories like these can be found on the [Kennedy Space Center Sustainability Website](#).









Sustainability is becoming embedded into our Center's culture and mission. Kennedy will ensure that future generations have the same opportunities and resources upon which to persist, thrive, and explore the world and universe around them. We will continue to stretch and strive in our efforts to execute NASA's mission without compromising our planet's resources, while ensuring future generations meet their needs.

Nancy P. Bray
Center Sustainability Officer
Director of Center Operations

Sustainability and Energy Scorecard

The Sustainability and Energy Scorecard provides a quick snapshot of Kennedy's performance in meeting the sustainability goals outlined in the 2013 to 2015 Kennedy Space Center Sustainability Plan. It provides a status for the functional areas spanning greenhouse gas (GHG) emissions, energy intensity, renewable energy, potable water intensity, fleet alternative fuel usage, green buildings, pollution prevention and waste management and sustainable acquisition. The Kennedy Environmental Management Branch monitors the performance in each of these categories to achieve a "Go for Green" status and to identify continuous improvements.

Functional Area	Criteria	Status	Score
	Scope 1 & 2 GHG Emission Reduction <u>Green:</u> Reduce GHG Scopes 1 & 2 by at least 7.6 percent compared to the FY 2008 baseline and is on track to achieve its FY 2020 target goal of 18.3 percent <u>Yellow:</u> Reduce GHG Scopes 1 & 2 by at least 6.1 percent and is on track to achieve its FY 2020 target goal of 18.3 percent <u>Red:</u> Did not reduce GHG Scopes 1 & 2 by at least 6.1 percent and is not on track to achieve its FY 2020 target goal of 18.3 percent	Scope 1 & 2 GHG Emission Reduction Reduced GHG Scopes 1 & 2 by more than 7.6 percent compared to the FY 2008 baseline and is on track to achieve its FY 2020 target goal of 18.3 percent *	
	Scope 3 GHG Emission Reduction <u>Green:</u> Reduce GHG Scope 3 by at least 5.1 percent compared to the FY 2008 baseline and is on track to achieve its FY 2020 target of 12.3 percent <u>Yellow:</u> Reduce GHG Scope 3 by at least 4.1 percent and is on track to achieve its FY 2020 target of 12.3 percent <u>Red:</u> Did not reduce GHG Scope 3 by at least 4.1 percent and is not on track to achieve its FY 2020 target	Scope 3 GHG Emission Reduction TBD: Kennedy initiated the development of methods for collection of GHG scope 3 data. Metrics will become available in FY 2014	
	Reduction in Energy Intensity <u>Green:</u> Reduce energy intensity (Btu/GSF) in goal-subject facilities by at least 24 percent compared with FY 2003 and is on track for 30 percent reduction by FY 2015 <u>Yellow:</u> Reduce energy intensity (Btu/GSF) in goal-subject facilities by at least 21 percent compared with FY 2003 <u>Red:</u> Did not reduce energy intensity (Btu/GSF) in goal-subject facilities by at least 21 percent compared with FY 2003	Reduction in Energy Intensity Reduced energy intensity by 38 percent in goal-subject facilities compared with FY 2003 baseline and is on track for 30 percent reduction by FY 2015	
	Use of Renewable Energy <u>Green:</u> Use at least 7.5 percent electricity from renewable sources as a percentage of facility electricity use. Of this 7.5 percent, at least half of facility electricity use comes from new sources (post-FY 1999) <u>Yellow:</u> Use at least 7.5 percent electricity from renewable sources as a percentage of facility electricity use but less than half was obtained from new sources (post-FY 1999) <u>Red:</u> Did not use at least 7.5 percent electricity from renewable sources as a percentage of facility electricity use	Use of Renewable Energy Used 21 percent of electricity from renewable electricity sources, including 14.1 percent from onsite renewable energy sources	
	Reduction in Potable Water Intensity <u>Green:</u> Reduce water intensity by at least 12 percent from FY 2007 baseline and is on track for 26 percent reduction by FY 2020 <u>Yellow:</u> Reduce water intensity by at least 10 percent from FY 2007 baseline <u>Red:</u> Did not reduce water intensity by at least 10 percent from FY 2007 baseline	Reduction in Potable Water Intensity Reduced potable water intensity compared with FY 2007 baseline by 5.5 percent and is on track for 26 percent in FY 2020 **	

Functional Area	Criteria	Status	Score
	<p>Increase in Alternative Fuel Usage to Overall Usage <u>Green:</u> Increase the ratio of Alternative Fuel Usage to Overall Fuel Usage by at least 1 percent compared to FY 2005 to achieve an overall 33 percent target in FY 2013 and is on track to achieve its 40 percent target by FY 2020 <u>Yellow:</u> Increase the ratio of Alternative Fuel Usage to Overall Fuel Usage by at least 0.5 percent compared to FY 2005 to achieve an overall 32.5 percent target in FY 2013 and is on track to achieve its 40 percent target by FY 2020 <u>Red:</u> Did not increase the ratio of Alternative Fuel Usage to Overall Fuel Usage by at least 0.5 percent in FY 2013 and is not on track to achieve its 40 percent target by FY 2020</p>	<p>Increase in Alternative Fuel Usage to Overall Usage Increased the ratio of Alternative Fuel Usage to Overall Fuel Usage by 1 percent thus achieving a total ratio of 35 percent and is on track to achieve its 40 percent target by FY 2020</p>	
	<p>Green Buildings <u>Green:</u> At least 11.3 percent of goal subject facilities, measured both in terms of gross area and number of facilities, meet Guiding Principles (GP) for Federal Leadership in High Performance and Sustainable Buildings and is on track to meet the comprehensive goal of 15 percent by FY 2015 <u>Yellow:</u> At least 11.3 percent of goal subject facilities, measured in either gross area or number of facilities (but not both), meet the GP and is on track to meet the comprehensive goal of 15 percent by FY 2015 <u>Red:</u> Did not demonstrate that at least 11.3 percent of goal subject facilities, measured in either gross area or number of facilities, met the GP and is not on track to meet the comprehensive goal of 15 percent by FY 2015</p>	<p>Green Buildings Incorporated GPs into all new Construction of Facility design contracts for construction and major renovations. Approximately 13 percent of goal subject facilities, measured both in terms of gross area and number of facilities, met GPs for Federal Leadership in High Performance and Sustainable Buildings. On track to exceed the comprehensive goal of 15 percent by FY 2015</p>	
	<p>Pollution Prevention and Waste Management <u>Green:</u> Divert 50 percent or more of non-hazardous solid waste (excluding Construction and Demolition (C&D) waste) and divert 50 percent or more of C&D waste <u>Yellow:</u> Divert at least 43 percent of non-hazardous solid waste (excluding C&D waste) and divert at least 43 percent of C&D waste and is on track to meet 50 percent goal by FY 2015 <u>Red:</u> Divert less than 43 percent of non-hazardous solid waste (excluding C&D waste) and divert less than 43 percent of C&D waste and is not on track to meet 50 percent goal by FY 2015</p>	<p>Pollution Prevention and Waste Management Diverted 61.7 percent of non-hazardous solid waste (excluding C&D waste) and diverted 76.6 percent of C&D waste</p>	
	<p>Sustainable Acquisition <u>Green:</u> At least 95 percent of new applicable contract actions contain requirements for sustainable products and services <u>Yellow:</u> At least 50 percent of new applicable contract actions contain requirements for sustainable products and services <u>Red:</u> Less than 50 percent of new applicable contract actions contain requirements for sustainable products and services</p>	<p>Sustainable Acquisition Applied environmentally preferred product requirements to 100 percent of applicable contract actions</p>	

* For 2013, the Energy Intensity Goal's reduction is a coarse indicator of GHG 1 and 2 emission reductions and engineering judgment indicates the emission's goal is exceeded. To better quantify the reduction in the future, additional sources of GHG 1 & 2 emissions will be identified, quantified, and tracked.

** Significant construction upgrades to Kennedy's water distribution system occurred in FY 2013. To maintain water quality and put new lines in service, considerable flushing and testing occurred. Although the annual goal was not met, the long-term water conservation goal is on track, particularly as the center begins reaping the efficiency benefits of the upgrades being performed now.

FY 2013 Highlights

Reduced Paper Use

The Construction of Facilities organization began using a web application platform as a submission point for construction project contracts, saving an estimated 22,250 pieces of paper for each construction project. With an average of 15 projects per year, this could potentially save well over 300,000 pieces of paper annually. Greenhouse gas emissions have also been reduced by digitizing the submission process, as shipping is no longer necessary.

POC: Gary Villa, gary.j.villa@nasa.gov



Reusable Canned Air Project

Kennedy conducted a pilot project using mini air compressors in place of canned air. This simple, innovative idea has become an affordable revolution against traditional canned air. Mini air compressors are an inexpensive, permanent and environmentally friendly alternative to canned air dusters. One can of normal canned air contains 3,000 times

the carbon dioxide impact on the atmosphere in comparison to 100 miles driven by an average vehicle. The mini air compressor is a safe and environmentally friendly alternative for cleaning your electronics. One full charge of the mini air compressor is equal to more than four cans of canned air and the mini air compressor will replace well over 1,000 cans of air in its lifetime. GHG was reduced by approximately 200 pounds and the government saved \$1,927 by deploying nine canless air compressors in labs and shops across the center.

POC: Mike Omans, michael.d.omans@nasa.gov

Spent Blast Media Project

Spent blast media material is one component of the debris deposited at Kennedy's landfill. Engineers are trying to develop methods to divert this material. One such project mixed used sandblasting material into concrete to find out whether the debris can be used to construct driveways and sidewalks. Workers mixed almost three tons of the sandblasting material into the concrete and used it to make a driveway and ramp near the Kennedy Space Center Propellants North Building.

The sandblasting material, basically sand pulverized into dust, replaced about 42 percent of ordinary sand in a typical concrete formula and kept sandblasting residue out of the landfill. This alternative concrete could be a candidate for use in foundations, driveways, and sidewalks. The pilot demonstrated that waste streams can be limited by novel repurposing of the by-products.

POC: Hien Nguyen, hien.t.nguyen@nasa.gov



Mist Eliminators

Kennedy installed a mist eliminator to one cooling tower that will save more than 500,000 gallons of water a year. Cooling towers are heat removal devices that use water evaporation to transfer process waste heat from generating chilled water to the atmosphere. Mist eliminators strip water droplets from the air to minimize the amount of water lost from the top of the tower. Without mist eliminators, as much as 4,320 gallons of water would be wasted daily.

POC: Bill Chardavoyne, william.c.chardavoyne@nasa.gov



Kennedy Refrigerant Reconditioning Program

Kennedy Space Center conducted several refrigerant recycling events which involved reconditioning waste refrigerants back to industry specifications for reuse within NASA. This activity has a combined benefit of cost savings and environmental stewardship. The initiative reduces the procurement costs of new refrigerants, eliminates refrigerants disposal costs and reduces the amount of solid waste produced by NASA. Success of these pilots was the impetus for a process change for managing waste refrigerants at Kennedy. Once fully implemented, this materials management process could be disseminated to all NASA centers. Typical refrigerant reconditioning events using this process at Kennedy achieved a 70 percent project savings and a 98 percent reduction in solid waste generated.

POC: Mike Omans, michael.d.omans@nasa.gov

Carpet Tiles

Kennedy Space Center diverted 13 tons of carpet tiles from various demolition and renovation projects. To minimize greenhouse gas emissions and save shipping costs, the carpet was collected and stored on site until there was a full truck load. These carpet tiles were then transported to a vendor who refurbished the material for reuse as either carpet or carpet padding. Once refurbished, the carpet was then installed at various nonprofit organizations.

POC: Alice Smith, alice.f.smith@nasa.gov



Diesel Fuel Recycle/Reutilization

Kennedy no longer sends used diesel fuel off-site for disposal. The new process, which filters and re-uses old diesel fuel, re-used approximately 5,000 gallons of fuel at a savings of more than \$11,000. The fuel was collected from the repairs of the Space Station Processing Facility two mega-watt generator and the crawler transporter fuel tank valves. This recycled fuel is being utilized by tanker trucks and various heavy-equipment assets around the center.

POC: Jon Rosiska, jon.t.rosiska@nasa.gov



Hard Hat Collection

Since Kennedy is always looking for ways to divert additional items from the landfill, the Recycling Program started the Hard Hat Recycling Project. Kennedy has collected approximately 1,000 hard hats that are no longer in good condition or have exceeded the recommended service life of four to five

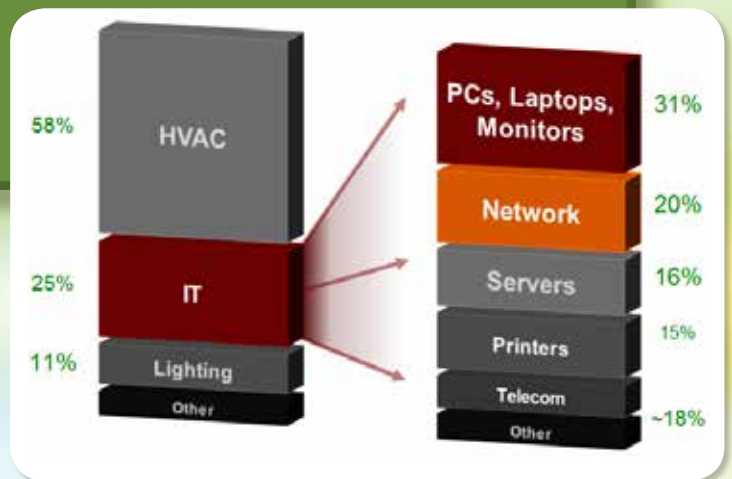
years. Currently, vendors are being reviewed for accepting the hard hat material.

POC: Annie Williams, ann.t.williams@nasa.gov

Computer Workstation Energy Management Study

Kennedy Space Center evaluated potential energy savings related to usage of computer workstations on center. This was prompted by the concern that 85 to 90 percent of the personal computers on center remain powered on all of the time. The study proved, using existing computing infrastructure, computers could be remotely shut down and turned on while still maintaining the ability to receive software patches, boot commands for Remote Desktop Protocol and other desirable functionality. The project also assessed the metered results of energy usage of different computer configurations over time. With these findings, there is the opportunity for a potential center-wide savings of more than \$100k annually.

POC: Cory Taylor, cory.a.taylor@nasa.gov



Sustainable Office Moves

Kennedy employed reusable plastic moving boxes, instead of cardboard, for three major moves. These boxes stack on four wheeled dollies to make for an easier moving day. The boxes are made from 100 percent recycled plastic and are reusable up to 400 times. Once their lifecycle ends, they are simply recycled again. The cost to rent sustainable moving containers, including delivery and pickup, saved Kennedy more than \$3,000. In addition to the financial and environmental savings, heavy lifting was minimized since dollies were embedded into the entire process, thus ensuring additional safety.

POC: Diane Bent, diane.c.bent@nasa.gov



Trash to Gas

NASA researchers focusing on the difficulties of traveling into deep space have identified an unusual source for fuel that astronauts generate during the mission: trash.

“We’re trying to change the mindset. We don’t want to just think of waste as something that occurs. We want to think of waste as a resource,” said Paul Hintze, task leader of the trash-to-gas project at NASA’s Kennedy Space Center in Florida.

Working in a laboratory at Kennedy, Hintze’s team built an 80-pound device that looks like a three-foot-long metal pipe to test theories about incinerating a variety of trash ranging from used clothes to uneaten food. The reactor holds more than three quarts of material and burns at about 1,000 degrees F, about twice the maximum temperature of an average household oven. It is expected to take astronauts four hours to burn a day’s worth of trash from a crew of four.

Kennedy’s trash to gas team selected steam reforming as the best waste process technology to accomplish their goals. This reforming process will be evaluated as it’s used for different types of waste. The team will now focus on designing a trash feed system for use in micro gravity.

During the course of a year in space – one half the length of time a mission to Mars is expected to take – trash processing for a crew of four would create about 2,200 pounds of methane fuel, enough to power a launch from the lunar surface, Hintze said.

Converting garbage into fuel would also keep astronauts from turning their cramped space capsule into an orbiting landfill. The research holds potential for use on Earth in areas of the world where there are neither large power plants nor garbage processing facilities. Using smaller reactors, villages could dispose of their own waste and reap the benefits or an extra source of fuel. The military and other organizations are interested in the project because of the potential to use reactors in remote locations to save on fuel shipping costs.

“Not only will the effort on this help space missions but also on Earth because we have enough problems dealing with our own trash,” said Anne Caraccio, a chemical engineer working on the project.

A flight-ready model that can be tried out on the International Space Station could fly as soon as 2018.



Anne Caraccio, NASA Chemical Engineer, works on an earlier model of the trash-to-gas reactor in a lab at Kennedy.

Greenhouse Gas (GHG) Scope III Emissions Pilot Project

An electric car charging pilot program at Kennedy Space Center shows that electric vehicles are reducing greenhouse gas emissions, such as carbon dioxide (CO₂), by a far greater amount than expected.

The program is working with 10 Kennedy employees who commute daily and plug in their cars at the center's charging stations. In return for receiving free charging, each of the workers fills out a spreadsheet every workday documenting how many miles were driven, including information about traffic conditions.

The program's first three months cost the Government \$148. The project recorded 18,055 emission free miles consuming 2,517 kilowatt-hours while eliminating 15,273 lbs. of CO₂ emissions with just the 10 drivers.

Considering the center employs approximately 8,000 people, the potential to significantly alter the amount of emissions from daily commutes by installing even a modest network of outlets is compelling. By deploying minimal infrastructure and getting people to plug in, Kennedy can do more to reduce GHG emissions and help reach NASA's goal of 12.3 percent scope 3 greenhouse gas emission reduction by 2020 without having to spend millions of dollars.



Car charging at charging station.



Meter at car charging station.

Bald Eagles Rescued

Kennedy Space Center is a nesting area for numerous bald eagles. When a strong thunderstorm blew through the center in early 2013, two eagles fell to the ground along with their nest. They were found by an InoMedic Health Applications Inc (IHA) ecologist who surveys the eagle nesting areas about three times a year.

The eaglets were believed to be about six to seven weeks old and were not yet mature enough to fly. While there are predators, such as bobcats, that could have threatened the eaglets, their main problem was dehydration. With the assistance of others from IHA and the Merritt Island National Wildlife Refuge, both birds were collected and taken to the Audubon Center for Birds of Prey.

A nest box was built with a wood frame, wire mesh in the bottom and filled with twigs and straw and placed in a pine tree near where the original nest was located. After being treated at the Bird Center, one of the eaglets was returned to this nest. The other eaglet had an eye injury; he was rehabilitated, trained and delivered to Sea World in San Antonio for use as an education bird. The nest box is currently used by a nesting pair of eagles.



*Above:
Eagle's nest.*



*Right:
Eagle
nesting box.*

Pathfinder Fitness Trail

The Pathfinder Fitness trail is a half-mile long trail with exercise stations that was built and became operational in 2013. In honor of Kennedy's launching heritage, its shape follows that of an orbiter silhouette. It is also named in honor of the first space shuttle orbiter test article, Pathfinder.

When the time came to begin the layout of this project, the design team saw an invaluable opportunity to integrate the past with the present while incorporating sustainability efforts. Volunteers completed the excavation and geotextile work in roughly two hours, saving thousands of dollars.

The sustainability team looks for any outlet for recycled material. Towards that objective, small particles of crushed rock, or fines, were utilized from the crawlerway renovation project performed by the Construction of Facilities organization. Once compacted, this material is durable, and is a great sustainable solution when compared to asphalt or concrete.

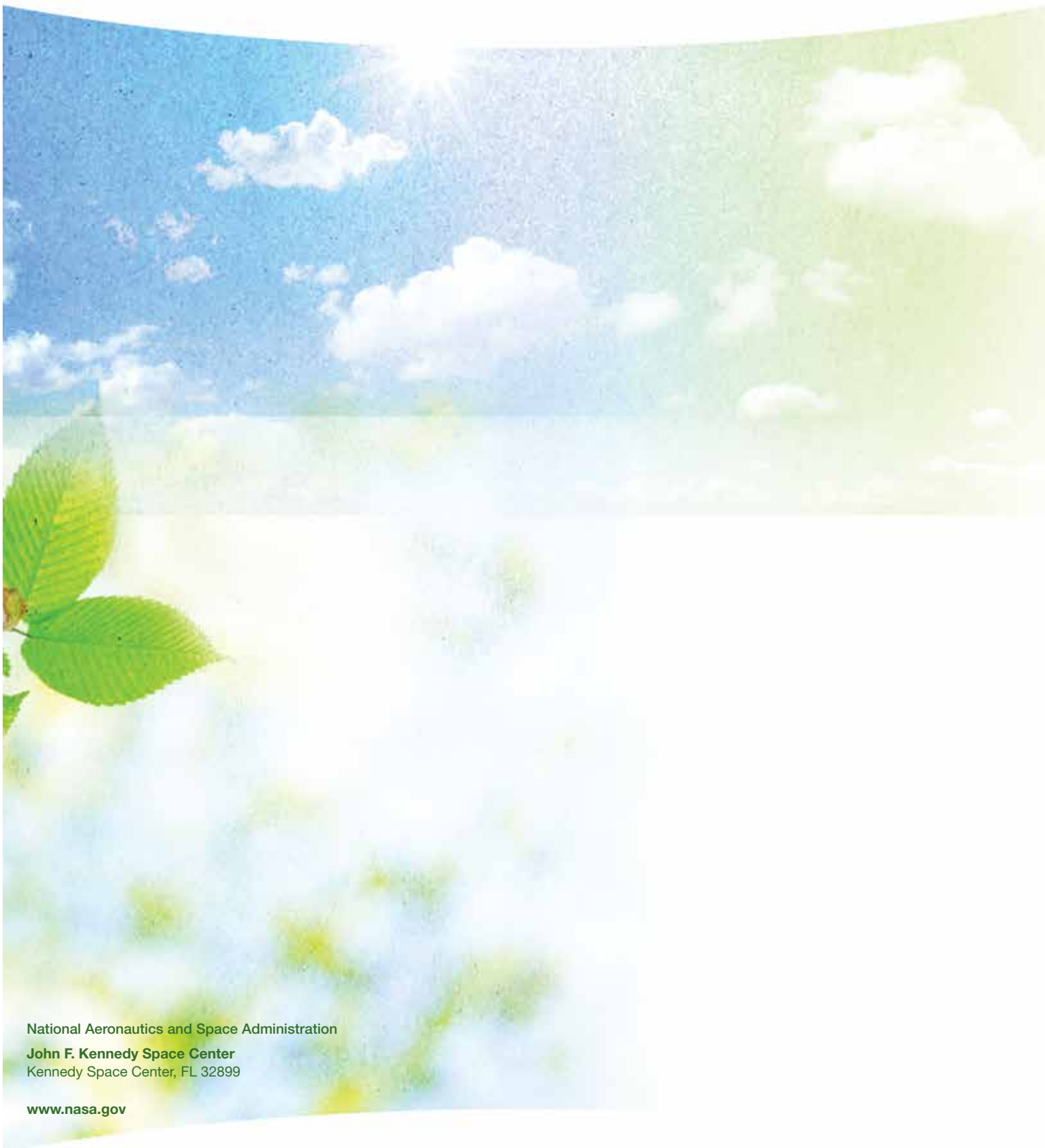
The exercise equipment stations are made with recycled content, making this fitness trail even more sustainable. This project also addressed Kennedy's Sustainability goal of workforce satisfaction. The trail combines scientifically designed, self-guided exercises with walking and jogging to provide a well-balanced physical fitness routine for the entire body.



Pathfinder Fitness Trail located east of Kennedy Space Center's Operation Support Building II.

To learn more about sustainability at KSC visit our **KSC Sustainability Website:**

<http://www.nasa.gov/centers/kennedy/about/sustainability/index.html>



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